5.2 COMPARISON OF PASTURE VARIETIES

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KEY MESSAGES

- Pasture species in these trials included phalaris, tall fescue, perennial ryegrass, annual and Italian ryegrass and sub-clover.
- There was a statistical varietal difference between perennial ryegrass varieties for dry matter production.
- There was no statistical difference in dry matter production within the other species (phalaris, tall fescue, annual and Italian ryegrass and sub-clover).
- The pasture variety trials will continue for the next few years to determine variety persistence and long-term productivity.

Keywords: pasture, livestock, phalaris, tall fescue, ryegrass, sub-clover

BACKGROUND

With so many options for pasture species currently available to producers in Australia, choosing the most suitable pasture variety for their grazing operation can be complex. Not only is feed production and timeliness of its production important, but also persistence of the species to ensure a return on the cost of renovation. The choice to renovate pastures for newer varieties can both increase feed production and ensure preferable pasture species persist. Producers also need to consider the suitability of a species or variety to their individual soil type, annual rainfall patterns, local growing season, and the grazing needs of their livestock.

The trials are based on the Meat and Livestock Australia (MLA) Pasture Trial Network (PTN), an independent accessor of pasture varieties. It also has an online tool designed for producers to compare the performance of pasture varieties by region and species. As the MLA PTN tool does not cover the regions of the Rokewood/Geelong area, our trials aim to fill the gap for local producers. Most varieties in the trial were selected on their suitability to the local area and high rainfall zone, whilst some deemed not suitable were also included to show varietal differences within species and highlight the importance of pasture variety selection when improving pastures. Pasture species in these trials included phalaris, tall fescue, perennial ryegrass, annual and Italian ryegrass and sub-clover.

METHOD

Trial Management

All varieties were sown on the 13th of May 2022 with 100 kg/ha of MAP at 200 mm row spacing. Table 1 shows the sowing rate used for each pasture species.

Table 1. *Trial pasture species and their respective sowing rates.*

Pasture species	Sowing rate/ha
Phalaris	4 kg
Tall fescue	15 kg
Perennial ryegrass	15 kg
Annual & Italian ryegrass	21 kg (tetraploids) 15 kg (diploids)
Sub-clover	10 kg

Slug bait was applied during the emergence phase to reduce the slug and snail damage to the plots. No herbicides were applied during the growing season. After biomass cuts, urea fertiliser (46% N) was applied at 50 kg/ha for all trials excluding sub-clovers and annual/Italian ryegrass. The annual/Italian ryegrass plots received 70 kg/ha of urea, to replace lost nitrogen.

During the year there was no grazing by livestock, and biomass removal was undertaken mechanically with a catch-and-weigh mower for biomass data collection.

Varieties

Phalaris

There are two types of phalaris - prostrate, semi-winter dormant and summer dormant cultivars and newer varieties that are more erect, winter active (WA) and medium summer dormant. Most winter active varieties require rotational grazing for optimal survival and production, whilst the semi-dormant varieties are more tolerant of set-stocking (Sergeant and Watson 2009). Winter active varieties were mainly used in the phalaris trial except for the traditional Australian phalaris which is semi winter dormant. The purpose of this is to show the difference in biomass production during different times within the growing season. The varieties trialled are outlined in Table 2.

Table 2. Phalaris varieties, the marketer and growth period.

Variety	Marketer	Growth
Amplify	Valley Seeds	Winter active
Holdfast GT	Barenbrug (bred by CSIRO)	Winter active
Holdfast	AGF Seeds	Winter active
Stockman	Upper Murray Seeds	Winter active
Australian	AGF Seeds	Semi winter dormant
Confederate	PGG Wrightson (DLF Seeds)	Winter active

Table 3. Tall fescue varieties, the marketer and growth period.

Variety	Marketer	Growth
Charlem	Upper Murray Seeds	Winter active
Temora	DLF Seeds	Winter active
SF Finesse-Q	RAGT	Summer active
Fortune	Barenbrug	Summer active
Prosper	Barenbrug	Winter active
Hummer	DLF Seeds	Summer active

Table 4. Perennial ryegrass varieties, the marketer, number of chromosomes and maturity notes.

Variety	Marketer	Ploidy (no. of chromosomes)	Notes on Maturity
Victorian	AGF Seeds	Diploid	Mid maturing, origin Vic, an ecotype
Avalon AR1	VicSeeds	Diploid	Mid-late maturing + 13 days to Vic
SF Hustle AR1	RAGT	Diploid	Late maturing + 15 days to Vic
Reason AR37	PGG Wrightson (DLF Seeds)	Diploid	Mid maturing + 10 days to Vic
Base AR37	DLF Seeds	Tetraploid	Late maturing
Maxsyn NEA4	DLF Seeds	Diploid	Mid to late maturing

Table 5. Annual and Italian ryegrass varieties, the marketer, number of chromosomes and maturity notes.

Variety	Marketer	Ploidy (no. of chromosomes)	Notes on Maturity
Fuze	Barenbrug	Diploid	ARG – Late spring
New Tetila	Vic Seeds	Tetraploid	ARG – Late spring
SF Pinnacle	RAGT	Tetraploid	ARG – Late spring
Manta	AusWest (DLF Seeds)	Diploid	Italian ryegrass – may survive 2 years
Tempo	Barenbrug	Diploid	Italian ryegrass – may survive 2 years
Feast II	DLF Seeds	Tetraploid	Italian ryegrass – may survive 2 years

Table 6. Sub-clover varieties, the marketer, sub-clover type and maturity.

Variety	Marketer	Sub Species	Maturity
SF Yanco	RAGT	Yannicum	Mid
Trikkala	AGF Seeds	Yannicum	Mid
SF Narrikup	RAGT	Subterranean	Mid
Antas	Barenbrug	Brachy	Mid-late
Campeda	Barenbrug	Subterranean	Mid
Bindoon	DLF Seeds	Subterranean	Mid

Tall Fescue

The tall fescue trial contained winter active (WA) and summer active (SA) cultivars. The summer active varieties are well suited to heavy soil types, summer rainfall or areas with above 600 mm annual rainfall. Although Rokewood has heavy clays, it may struggle to persist given it is generally not a wet summer environment. The varieties trialled are outlined in Table 3.

Perennial Ryegrass

All ryegrasses are identified as diploid or tetraploid. Diploids have two chromosomes per plant cell while tetraploids have four. Diploid plants have a lower water content per cell and therefore have a greater dry matter per kilogram of pasture than tetraploid plants. Leaves are generally smaller and thinner in diploids and tend to have more tillers per plant. Because of this, diploid grasses can provide dense ground cover, suited to areas of pugging and overgrazing. In comparison, tetraploid grasses are more palatable, contain marginally higher metabolizable energy levels and have less ground cover, leaving room for clovers (Dairy Australia n.d).

In the perennial ryegrass trial, a variety of each ploidy was selected to show the difference in DM production between the two types. The varieties trialled are outlined in Table 4.

Annual & Italian Ryegrasses

Italian ryegrass varieties may persist into a second year under favourable moisture and temperature conditions over summer but have variable results as they need low summer temperatures. Annual ryegrasses may persist with the correct grazing management and climatic conditions (Launders *et al.* 2010). The varieties trialled are outlined in Table 5.

Like the perennial ryegrass trial, a variety of each ploidy was selected to show the difference in DM production between the two types.

Subterranean (Sub)-Clover

Subterranean cover has three subspecies (ssp). Ssp subterraneum sub-clovers are suited to well drained, neutral to moderately acid soils; Brachycalycinum sub-clovers are suited to neutral to alkaline soils; Yannicum sub-clovers are suited to poorly drained, waterlogged sandy loam and clay soils (Nichols 2021). A variety of the three subspecies were selected for comparison listed in Table 6. Mainly mid maturing varieties were selected which allows them to flower and set seed before conditions dry out.

Data Collection & Analysis

Plant establishment counts were completed on the 29th of July, approximately 10 weeks post sowing, using a 1 m stick, counting the number of plants in two crop rows and multiplying to get plants/m^2.

Pasture biomass was collected during the growing season based on the height and density of the plants. Sub sample measurements were taken using a cordless handpiece and oven-dried to determine moisture content of each variety. A ride-on mower with a built-in weighing system was used to mow and weigh the standing pasture in each plot to determine biomass. Four cuts were taken at the beginning of September (measuring DM production over winter), mid-October (measuring DM production for early spring), early December (measuring DM production for late spring) and early March (measuring DM production over summer). The number of cuts taken was limited by trafficability in the paddock. Cuts were to be taken when the plants reached 10 cm in height or 2000 kg DM/ha, but often were taken at 30 cm+. At each harvest the pasture was cut to a residual height of 5 cm.

RESULTS & DISCUSSION

Establishment

There were no statistical differences within the species between any of the varieties and plant establishment. Table 7 shows the species, sowing rate, observed establishment range and percentage of establishment. Based on Nie and Saul (2006) figures, the percentage establishment was low for all pasture species but can be regarded as 'satisfactory' if appropriately managed.

Dry Matter Yields

Phalaris

In the first year, there were no statistical differences between varieties for any of the biomass harvest dates. Holdfast produced the highest total dry matter from the four cuts (8296 kg DM/ha) and the newer varieties all outperformed the old Australian variety, which produced the lowest amount of total dry matter (7473 kg DM/ha) shown in Figure 1. Out of all the pasture species, phalaris produced the highest dry matter over summer of 4439 kg DM/ha.

Table 7. Trial pasture species and number of seeds sown based on sowing rate and the observed establishment.

Species	Sowing Rate/ha	No. of Seeds Sown^	Observed Establishment (Plants/m²)	% Establishment
Phalaris	4 kg	290	61 - 82	21 – 28%
Tall fescue	15 kg	645	196 - 275	30 – 43%
Perennial ryegrass	15 kg	800	283 - 328	35 – 41%
Annual & Italian ryegrass	21 kg (diploids), 15 kg (tetraploids)	1120 (diploids), 800 (tetraploids)	255 (diploids), 244-261 (tetraploids)	23% (diploids), 31–33% (tetraploids)
Sub-clover	10 kg	180	32 - 63	18 – 35%

^ *Values taken from Nie and Saul (2006)*

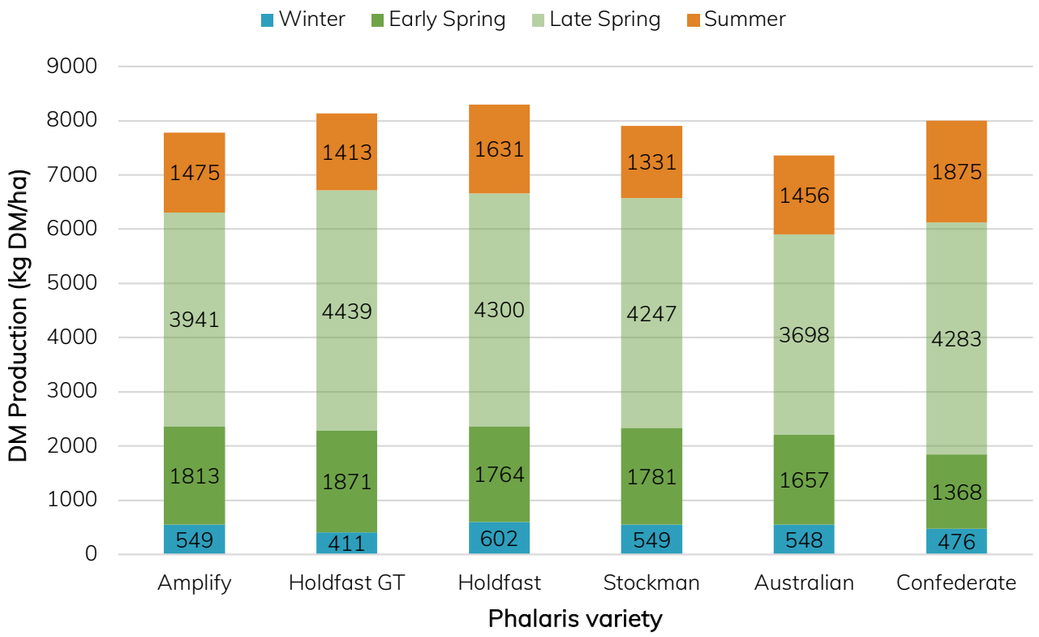

Figure 1. Phalaris varieties and their dry matter (DM) production (kg DM/ha).

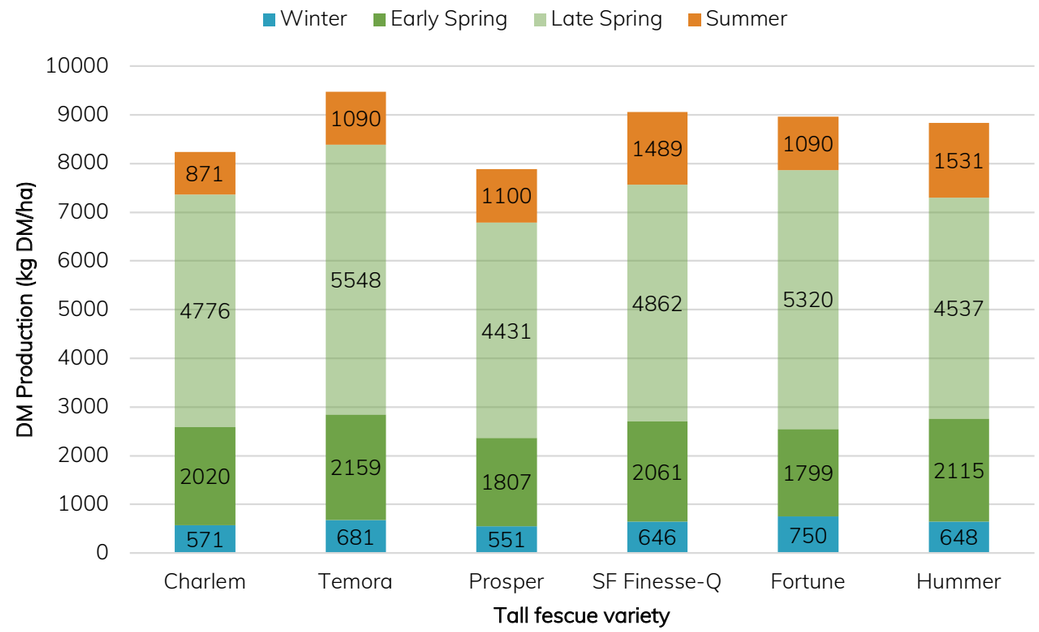

Figure 2. Tall fescue varieties and their dry matter (DM) production (kg DM/ha).

Tall Fescue

There was no statistical difference between the tall fescue varieties and their dry matter production. Temora (WA) produced the highest amount of dry matter (9519 kg DM/ha) and Prosper (WA) produced the least dry matter (7913 kg DM/ha) shown in Figure 2. Hummer and SF Finesse-Q (both summer active) as expected produced more dry matter in summer than the other varieties.

Perennial Ryegrass

There was a statistical difference between perennial ryegrass varieties for late spring biomass and overall dry matter production, Table 8. Base AR37 produced the highest amount of total dry matter (12,486 kg DM/ha), significantly higher than all other varieties. All other varieties produced between 7413 kg DM/ha (Reason AR37) and 8648 kg DM/ha (Avalon AR1) shown in Figure 3. There was also a statistically significant difference between variety DM production for the 'Late Spring' harvest cut, with Base AR37 producing 9830 kg DM/ha, significantly higher than all other varieties which produced between 5000 to 6300 kg DM/ha shown in Figure 3. There was no growth over summer for measurement. Base AR37 was the only tetraploid variety in the trial, and is late maturing, which produced the most annual dry matter of any cultivar in its first year, from May to December 2022. It has also been the number one performer in Dairy Australia's Forage Value Index for the last six years (2018-2023). The variety has been bred from high yielding, densely tillered plants that survived drought and hard sheep grazing (DLF Seeds, 2023).

Annual & Italian Ryegrasses

There were no statistical differences between varieties and dry matter productions in the annual and Italian ryegrass trial. Varieties produced between 7711 kg DM/ha (Manta) and 6922 kg DM/ha (SF Pinnacle) shown in Figure 4. The annuals did not produce more than the perennial ryegrass species. This seems to be consistent with other PTN trials. Well above average rainfall during October and November restricted harvesting at this time, and they may have benefited from another late season cut to encourage growth. Annual ryegrass' fit in the system is often during a pasture renovation phase to produce hay or silage.

Subterranean (Sub) clover

The sub-clover trials were only cut once during the growing season, to ensure that seed set and burr formation of the varieties was not suppressed. There were no statistical differences between sub-clover varieties and DM production, shown in Figure 5. DM production varied from 1161 kg DM/ha (Campeda) to 1751 kg DM/ha (Bindoon). As no herbicides were applied during the year to prevent damage to seed production, some clover varieties became outcompeted by grass weeds which may have contributed to less dry matter yield shown in Figure 6. It was noticeable that sub-clover did not produce the bulk of feed compared to the grasses and were not a stable single species pasture. Their shorter stature and nitrogen production encouraged weed invasion. Antas in particular produced lots of surface burr which is characteristic of Brachy sub species in comparison to other cultivars which tried to bury burr shown in Figure 7.

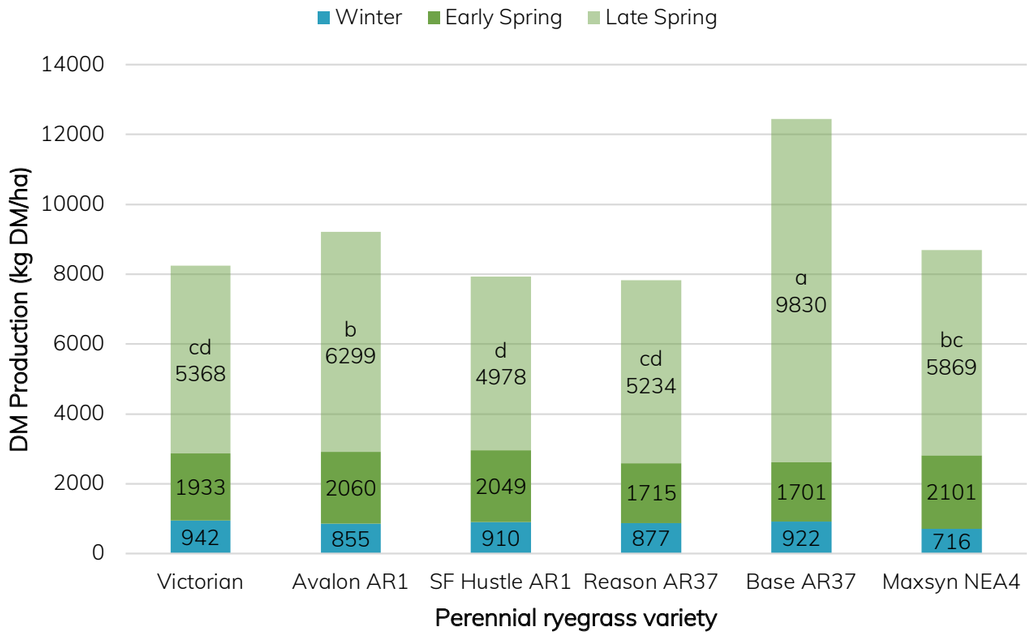

Figure 3. Perennial ryegrass varieties and their dry matter (DM) production (kg DM/ha). Means followed by the same letter do not significantly differ (p>0.05).

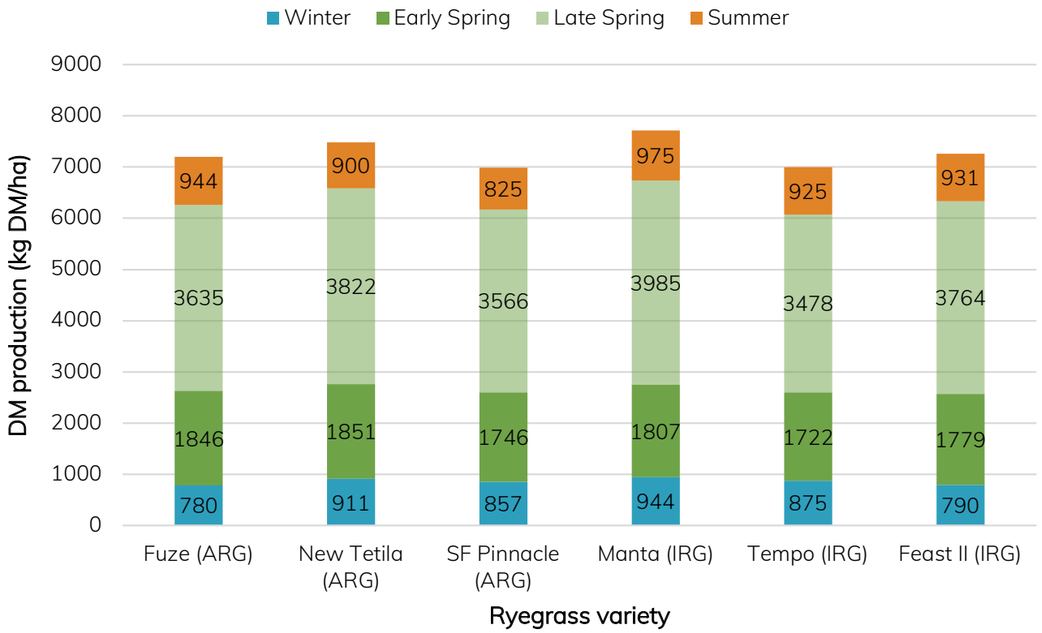

Figure 4. Annual and Italian ryegrass varieties and their dry matter (DM) production (kg DM/ha).

Table 8. Late spring biomass and total biomass production for perennial ryegrass.

Variety	Late Spring Biomass (kg DM/ha)		Total Biomass Production (kg DM/ha)	
Base AR37	9,830	a	12,486	a
Avalon AR1	6,299	b	8,646	b
Maxsyn NEA4	5,869	bc	8,235	b
Victorian	5,368	cd	8,052	b
Reason AR37	5,234	cd	7,413	b
SF Hustle AR1	4,978	d	7,965	b
LSD	832		1600	
***p*-value (0.05)**	<0.001		0.002	

Means followed by the same letter do not significantly differ (p>0.05).

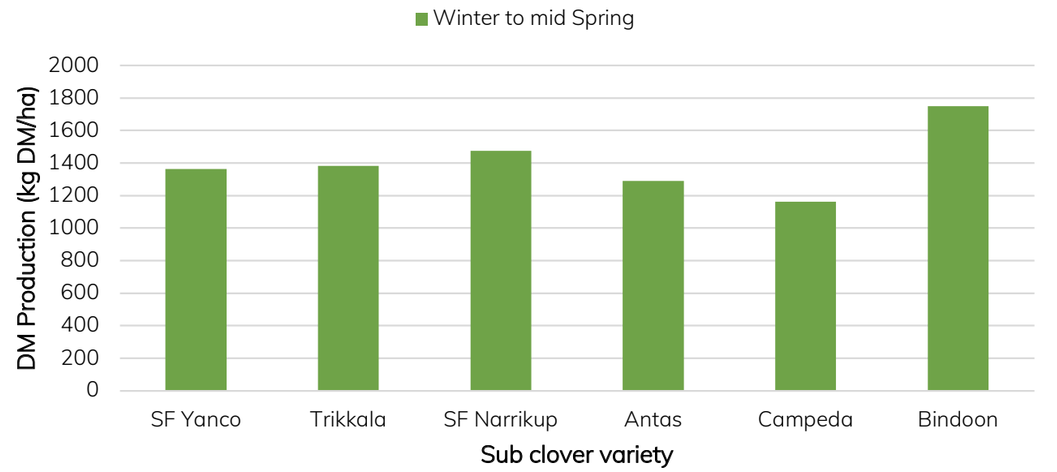

Figure 5. Sub-clover varieties and their dry matter (DM) production (kg DM/ha).

Figure 6. Bindoon trial plot invaded by winter grass (5-10-22).

Figure 7. Antas surface burr (7-12-22).

CONCLUSION

Although most of the pasture species trials did not have significant results, this trial still highlights the importance of selecting the best varieties when choosing to renovate pastures. This is evident in the perennial ryegrass trial where Base AR37 was the standout variety, producing significantly higher dry matter than all other varieties.

The trial now looks to the future, with pasture persistence and productivity to be measured over the next few years across different seasons. In the sub-clover trial, whilst Bindoon sub-clover dry matter production was highest, the wet spring may have favoured seed production of the white seeded Yannicum sub-clovers. After the wet spring, summer was quite dry which may have affected the persistence of perennial, annual and Italian ryegrasses. Look out for these results in the 2023 Results Book.

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